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关于“环境贴现率”问题的探讨

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摘要　推导一个描述私人利润率和社会利润率之间关系的新公式。该公式涉及的 2 个相关的环境参数为：环境投资占国民收入的百分比(λ)；从环境投资角度出发定义的环境改善的弹性(η)。公式表明，从环境的观点出发，社会利润率或环境贴现率应该随时间而系统地降低。此外，本文还引用了“环境阻力”的概念来论述模型的意义，同时还简要地讨论了环境阻力的计算方法。

关键词　社会利润率，私人利润率，环境贴现率，国民收入，GNP，环境改善弹性，环境损害水平，环境阻力。

1　概论

从社会角度出发的经济效益或费用的时间价值称为社会贴现率。这种时间价值的存在主要基于下面 2 种原因：① 消费者对消费时间的偏好，这种偏好出自于人们普遍存在的短见和风险的规避，也出自于消费的边际效用的递减；② 从生产的角度也提供了现行消费或将来消费上选择的可能性，现在不消费，可以把节省下来的资源用于投资，由于投资提供了活劳动创造剩余价值的机会，造成将来多于现在的可能消费。至于“环境贴现率”，它是基于这样一个事实提出来的，由于环境污染，生产活动存在外部不经济性，环境负面影响的增加必将导致社会贴现率的降低，从经济学的观点来看，环境被认为是一个典型的外部时间变量，所以这种影响不仅关系到社会贴现率的水平，而且影响到贴现的时间断面。在收入和经济活动处于较低水平时，环境对贴现的影响问题不会引起人们的关注。然而，随着收入和经济活动水平的提高，环境的这种影响就变得越来越重要。

经济的发展引起环境问题是人所共知的。因环境问题造成外部不经济性必将导致社会利润随时间降低也是不容置疑的。对该问题可以建立一个结构模型，用以表达私人利润率（企业）和社会利润率之间的关系。研究表明，社会利润率可以表示成私人利润率乘以一个调整系数，该调整系数是环境投资占国民收入的百分数以及环境改善的弹性 2 个相关的环境变量的函数。

此外，本文还引用了“环境阻力”的概念阐述模型的意义。所谓环境阻力，指的是因环境投资所引起的社会利润率下降的程度。在本文的最后还讨论了应用模型计算环境阻力的方法。

2　模型

为了集中考虑环境外部不经济性和社会利润率之间的关系，假定经济活动中没有其它的扭曲[1]。有许多文献论述了为什么私人资本的市场利润率不能用真实的社会机会成本来计算的理由，本文在此不再赘述。为了分析上的方便，建立模型时，假定整个社会只有一个经济生产部门，并且只生产一种产品。基于以上假设，如果用 t 表示时间，V 表示计算的资本。I 代表净投资。于是有：

$$I(t) = V(t+1) - V(t) \tag{1}$$

如果 Y 表示国民收入，根据生产理论[2]，在 t 时刻的国民收入为：

$$Y(t) = F(V(t), t) \tag{2}$$

设用 C 代表传统的消费水平；D 表示环境

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损害水平。且定义环境损害水平 D 可以通过环境投资促使环境改善来减轻。如果用 $\Phi(t)$ 表示在时间 t 花费在环境改善上国民收入的总量(即环境总投资)，则：

$$Y(t) = C(t) + \Phi(t) + I(t) = F(V(t), t) \quad (3)$$

现在，假设在任一时刻 t，每单位经济活动造成的环境损害水平是同一时刻环境投资的函数，则：$\frac{D}{Y} = G(\frac{\phi}{Y}, t)$，$G' \equiv G_1 < 0$，$G'' \equiv G_{11} > 0$　(4)

式(4)的关系式似乎有点免强，但它体现这样一种思想，即单位经济活动的污染排放所引起的环境损害是削减费用的函数。这种抽象是否合理暂且不论，但对整个经济系统来说似乎是符合逻辑的。设变量　$\lambda \equiv \Phi/Y$　(5)

它表明，国民收入用在环境改善上的份额，即环境投资占国民收入的百分数。

再定义　$\eta(\lambda, t) = -\frac{\lambda G'}{G}$　(6)

表示环境改善的弹性，它是从环境投资的角度提出来的。η 表示环境投资增加 1%时，环境恶化降低的程度。定义的 λ 和 η 是本文模型中的重要参数。

给定初始的资本储存 $V(0)$，如果对于所有的 t，它满足式(3)和(4)，那么，环境规划$\{C(t), D(t)\}$是可行的。

本文需要论证的是与可行的环境规划相连的社会利润率的表达式。为此，再设私人资本的利润率为 $i = i(t)$。如果忽略环境约束的话，那么，私人利润率可以用利息率来表示。在完全竞争的市场经济中，企业利润率恰好等于资本的边际生产率[5]，即：

$$i = F' \quad (7)$$

设在时间 t，消费水平 $C(t)$ 随生产投资的增加而减少。当生产投资增加微量 δ 时，引起在时间 $t+1$ 时产出(或国民收入)增加 ΔY，ΔY 可以用下式表示：

$$\Delta Y = F' \cdot \delta + O(\delta^2) \quad (8)$$

式中，$O(\delta^2)$是 δ^2 的高阶项。

式(8)表示，在时间 $t+1$，当规划的其余部分保持不变时，节省额外的消费用于生产。生产的收益、即企业的利润率(i)取决于资本的边际生产率(F')。然而，当考虑环境影响时，式(8)必须作适当的修正，方能正确计算社会利润率。

在给定的生产技术水平下，生产的增加意味着环境的恶化程度也随之增加。也就是说，在 $t+1$ 时间内，当产出从 $Y(t+1)$ 增加到 $Y(t+1)+\Delta Y$ 时，环境的恶化也随之增加。在 $t+1$ 时，如果要保持生产增加前的环境水平 D，那么，为了抵消因产出增加 ΔY 而产生的环境恶化，就必须相应增加环境投资 $\Delta\Phi$。关于 ΔY 与 $\Delta\Phi$ 的关系可以根据经济学理论和方法计算出来[1]。现求解如下：

对于恒定的 $D = (\bar{D})$，即 D 不随 t 而变化，则式(4)可以表示为：

$$\bar{D} = Y \cdot G(\Phi/Y) \quad (9)$$

考虑到在式(9)中，Φ 作为 Y 的隐函数，故可写成 $\Phi = \Phi(Y)$。当 D 保持不变时，用 Φ 对 Y 求导数，即通过对式(9)求 Y 的隐微分，于是产生：

$$O = G(\Phi/Y) + YG'(\Phi/Y)[\Phi'/Y - \Phi/Y^2] \quad (10)$$

化简得：$\Phi' = \Phi/Y - G/G'$　(11)

使用式(5)和式(6)中定义，方程(11)可以写成：

$$\Phi' = \lambda(1 + 1/\eta) \quad (12)$$

从泰勒的近似展开式中可以获得：

$$\Delta\Phi = \Phi'\Delta Y + O(\Delta Y^2) \quad (13)$$

略去 ΔY^2 的高阶项，并结合式(8)，(10)和(12)，则可以得到：

$$\Delta\Phi = \lambda(1 + 1/\eta)[F' \cdot \delta + O(\delta^2)] \quad (14)$$

根据消费理论的概念，用 $r = r(t)$ 表示社会利润率，它表示在时间 t 节省的微小单元消费 δ，在 $t+1$ 时可供使用的额外净消费量。根据消费理论，$r(t)$ 可以表示成下列极限：

$$r = \lim_{\delta = \to 0} \frac{\Delta Y - \Delta\Phi}{\delta} \quad (15)$$

式中，ΔY：额外的总的潜在的消费：$\Delta\phi$：相应 ΔY 增加的环境投资。结合式(7)式(8)和式(14)，并求极限，有：

$$r=\lim_{\delta\to 0}\frac{[F'\delta+O(\delta^2)]-\lambda(1+1/\eta)[F'\delta+O(\delta^2)]}{\delta}$$

$$=F'-F'\cdot[\lambda(1+\frac{1}{\eta})]$$

$$=i[1-\lambda(1+1/\eta)]$$

即：

$$R=i[1-\lambda(1+1/\eta)] \tag{16}$$

方程(16)是本文的中心结果。它表达社会利润率或环境贴现率和私人(企业)利润率之间有一定的关系。该式仅涉及到环境投资占国民收入的百分比 λ，以及从环境投资角度出发定义的环境改善弹性(η)2 个参数。式(16)右边的变量 i，λ，η 在某种意义上是可操作的，至少原则上是可知的。

3 关于环境阻力的概念和模型的意义

在式(16)中，如果令 $\xi=\lambda(1+1/\eta)$，则它变为：$r=i(1-\xi)$ (17)

$\xi=\lambda(1+1/\eta)$可以认为是一个矫正因子，国际上习惯称它为环境阻力系数[2]。关于环境阻力具有如下的解释：设某年度节省下的某个微小消费单元能够投入生产，增加的收益可以被“储存”起来。如果没有环境标准的约束，那么节省的消费单元投入生产产生额外的消费单元 i，可以被带到下一年，假定它没有影响到未来的消费。然而，由于现行环境标准的制约，只允许消费收入的额外单元 γ 被拿走，而另一部分因环境改善的需要而被消耗掉了。当 $\eta\to\infty$ 时，$\xi=\lambda$。也就是说，当环境改善相对来说比较容易时，环境阻力的大小可以粗略地用环境投资占 GNP 的百分比[1]来代替。在此情况下，所有经济活动的增加产生负的环境影响均能被较大的环境投资所抵消。较低的社会贴现率不仅是经济增长减慢的信号，而且表示环境投资也需增加。

然而，当 η 较小时，即环境不易改善，那么，任意假设一个 λ，可以计算出多个矫正因子。此时，收入的增加很难抵消环境污染造成的破坏。这是环境阻力的较高的信号，该阻力独自用环境投资来表示。经济的增长不能消除环境损害，说明对于给定的环境投资，它具有较低的社会利润率。在此情况下，较低的社会利润率也是经济增加变慢的信号，其原因是负的环境影响造成的。

说明 η 如何随时间变化是很困难的。作为一种粗糙的近似，可以假定 η 是个常数。另一方面，也可以这样认为，收入的一部分贡献于环境投资 λ，它应该随不同的发展阶段和时间而增加。因为经济活动的变化，通过污染、生态破坏等，导致环境损害的水平更大。一般地说，周围的环境在具有较高收入弹性的情况下，可以代表一种奢侈品。在任何情况下，可以作出如下合理的假设：当经济发展时，收入的一部分应贡献于环境投资，即环境投资应随时间而增加。因此，随着时间的推移，应该使社会贴现率低于私人贴现率。

必须说明：社会投资利润率随发展水平而减小，是因为每个额外的消费单元，相对于经济增长引起的负的外部性来说，其价值在变小。这个逻辑说明了为什么社会或环境利润率相对于私人利润率来说，希望其随时间而降低的道理。在一定的程度上，任一贴现率保持恒定的假设是恰当的，它很可能就是私人利润率。在这样的情况下，出于对环境保护的考虑，本文不仅赞成社会利润率低于私人利润率，而且希望其随时间而系统地降低。如果这一结论被重视的话，在社会项目的分析中，环境应该考虑更低的利息率，以贴现更长远的费用或效益。

4 关于 λ 和 η 的估算

式(17)中的阻力系数 ξ，是 2 个环境变量 λ 和 η 的函数。

国家环保局近年来已作过系统的研究[6]估算每年我国用于环境污染控制活动占 GNP 的百分数，这个百分数可以粗略地认为是 λ 的大

小。我国 1985 年环境总投资约占 GNP 的 0.66%，1990 年约为 0.80%，预计 2000 年约占 GNP 的 1.5%左右。本文需要强调的是，直接花费在环境改善上的费用是整个国家真实环境投资的大概估算，因为其对经济增长的间接影响被忽略了。

为了将 λ 转换成环境阻力，需从环境投资的角度出发，确定环境改善弹性 η 的大小。估算 η 比估算 λ 要困难得多。为了计算 η，有些数字是可以利用的：如通过把水中污染物实际排放量与假想工程(设其具有 1985 年的控制水平)相比较，说明环境治理投资的近似效果。这样的数字与相应的环境投资相配对，可以获得较为松散的 η 值，其范围大约在 0.5—1 之间。如果这个粗糙的范围被接受的话，从 ξ 的含义中可以看出，我国的环境阻力或许是用于环境污染控制投资的 2—3 倍。

η 的估算是很粗糙的。笔者对此问题无力作过深的研究，因为现有的资料不能足以支持更多特殊情况的分析。当需要对 η 作更加肯定的计算时，还要作大量的基础性工作。可以肯定，环境阻力对我国经济的影响大于直接用于环境改善的投资。环境阻力或许是直接环境投资的 2—3 倍。此将得到对环境阻力的现行估算。如到 2000 年，环境投资的范围大约占 GNP 的 3%—4.5%，而不是上述预测的 1.5%左右。如果整个时间内 η 保持恒定，而 λ 在未来将连续上升，现在讨论的环境阻力的程度在未来的某个时间期内将急剧增加，比方说，半个世纪或更长。当这一天到来时，社会利润率或环境贴现率也许会极大地降低。如果上述情况发生，其经济前景与今天分析的情况将有根本性的差别。

5 结论

(1) 由于存在环境的外部不经济性，社会投资的利润率应该低于私人投资的利润率，两者的差距可以认为是环境阻力作用的结果。

(2) 基于结果论(1)，在社会项目的开发与建设中，采用的环境贴现率应该象社会投资利润率一样，即应该随时间而系统地降低，以贴现未来的效益。较低的环境贴现率有利于环境保护和社会的可持续发展。

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that PCP removal by granular sludge in UAD reactors was due to biodegradation rather than adsorption and volatilizaiton.

Key words: pentachloropenol, biosorption, de-sorption, biodegradation, anaerobic.

Photocatalytic Oxidation of Benzene Hexachloride and Pentachlorophenol in Aqueous Solution. Li Tian and Qiu Yanling (School of Environ. Eng., Tongji Univ., Shanghai 200092): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 24—26

Photocatalytic oxidation of low concentration of benzene hexachloride (BHC) and pentachlorophenol (PCP) in aqueous solution is studied with a high pressure mercury lamp as radiation resource and TiO_2 as a catalyst. BHC can be oxidized easily, half life periods of the 4 isomers of BHC are all around 20 minutes. Oxidation rate of γ-BHC is higher under neutral condition. Chlorinated medium products formed in the photocatalytic oxidation of BHC can be gradually removed by further reaction. For PCP reaction rate of photocatalytic oxidation is much higher than that of photolysis. Dechlorination of PCP can be completed within 30 minutes. As the reaction process continues, PCP will be oxidized into simple small molecules and finally mineralized completely. It is predicable that photocatalytic oxidation has bright prospect in advanced treatment of drinking water.

Key words: photocatalytic oxidation, benzene hexachloride, pentachlorophenol, aqueous solution.

The Dissipation and Residue of Quinclorac in Rice Field Water, Soil and Rice Plant. Wang Yiru et al. (Institute of Agro-environmental Protection, Tianjin 300191): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 27—30

Quinclorac is a new herbicide with high efficiency and low toxicity. The field experiments were carried out both in Tianjin and Jilin Province in 1993 and 1994, respectively. It has been found that the herbicide dissipated rapidly from water and leaves. Its half life values in the water was 0.8 days in Tianjin and 2 days in Jilin, and the half life in rice leaves was less than 1 day. The residure in sediment remained quite low during 6 days of half life. No metabolite was detected in soil. Applied to rice field as a 50% WP formulation at the recommended rates of 412.5 g—525 g/hm^2, one application, preharvest interval 96—105 days, the residue remaining in unpolished rice was less than 0.005 mg/kg, far below MRL, and was safe to humanbeing.

Key words: Quinclorac, metabolite, dissipation, final residue, water, rice, soil.

Wet Air Oxidation Treatment of H-acid Production Waste Liquor. Wang Yongyi et al. (Dept. of Environ. Eng., Tsinghua Univ., Beijing 100084): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 31—33

Under the condition of reaction temperatures of 200—250℃, initial oxygen partial pressures of 1—3 MPa, the wet air oxidation (WAO) of H-acid has 2-step process, including rapid reaction step, in which during the first 10 minutes after the beginning of the reaction COD is decreased rapidly, and UV/Vis. absorbance is increased drastically at first and then reduced rapidly, and slow reaction step, in which, both COD and UV/Vis. absorbance are decreased slowly during about 20 minutes. WAO treatment can improve biodegradability of H-acid significantly. After 1 hour reaction carried out at 160℃ and 3 MPa initial oxygen pressure, COD was decreased by 50%, and the BOD_5/COD ratio of 10 g/L H-acid solution was increased from 3.4% to 33.3%. The offgas from the WAO treatment of H-acid contains undetectable amount of SO_2 and nitrogen oxides.

Key words: wet air oxidation, H-acid, biodegradability.

Emission Factors of Trace OCS from Crop Residues Burning and Estimation Its Amount in China. Cao Meiqiu and Zhuang Yahui (Research Center for Eco-Environmental Sciences, CAS, Beijing 100085): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 34—36

A method of sampling and analysis for trace carbonyl sulfide has been described. The sample is trapped and concentrated at temperature of liquid N_2 and liberated directly into a gas chromatographic column. The concentration of OCS in compressed air as determined as 2.94×10^{-3} μg/L. The method accuracy expressed in term of standard deviation coefficient is $\pm0.72\%$. The emission factors of carbonyl sulfide, which were measured during the combustion of rice straws, maize stalks and wheat stalks in an enclosed combustion system, are 1.80, 2.75 and 2.05 g/t for rice straws, maize stalks, and wheat stalks, individual. Standard deviation coefficient are $\pm6.67\%$, $\pm8.36\%$, and 9.27% for rice straws, maize stalks, and wheat stalks, respectively. Distribution of the amount of crop residues burned in China is presented with a resolution 1° latitude × 1° longitude. The amount of trace OCS could be calculated with their emission factors.

Key words: carbonyl sulfide, biomass buring, emission factor.

The Study of Trace Elements in Human Hair from the Area of Endemic Arsenism. Jiang Ling et al. (Institute of Environ. Medicine, Tongji Medical Univ., Wuhan 430030): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 37—39

217 hair samples and environmental samples from endemic arsenism in Linhe, Inner Mongolia were analyzed. The results showed that the levels of As, Cu and K in hair in studied area were higher than that in control area, but Zn and Se was opposite. The relationship between the typical symptoms of arsenism and the levels of As, Cu, K and Se in hair were found. There were rank correlations between the concentration of Se, Zn, Cu in hair and As in hair (the coefficient = −0.988, −0.794, 0.783, respectively).

Key words: endemic arsenism, trace elements, hair.

Research for the Problem about the Environmental Discount Rate. Wang Yonghang and Fu Guowei (Dept. of Environ. Eng., Tsinghua University, Beijing 100084): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 40—43

This paper presents a new formula, which describes the relation between private rate or return and social rate of return. The formula includes two environmental parameters, λ, the fraction of national income spent on environmental investment, and η, the elasticity of environmental improvement with respect to environmental spending. From the formula it can be seen that social rate of return or environmental discount rate should decline systematically over time from the point of view of environmental

protection. In addition, the environmental drag were used to explain the model's meaning as well as to discuss the measurement of the environmental drag.

Key words: social rate of return, private rate of return, elasticity of elasticity, environmental discount rate, environmental investment, environmenal improvement, environmental drag.

The Growth and Purification Function of *Eichhornia crassipes* Solms in Oil-refinery Wastewater. Tang Shuyu et al. (Institute of Botany, Jiangsu Province and Chinese Academy of Sciences, Nanjing 210014): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 44—46

The growth of *Eichhornia crassipes* Solms in oil-refinery wastewater has been described in this paper. An influence of COD, a comprehensive index of the pollultant concentration in the wastewater, on the growth of *Eichhornia crassipes* Solms was quantitatively studied. It was found that an optimum working condition for treating oil-refinery wastewater by *Eichhornia crassipes* Solms eco-engineering is established as follows: 65 mg/L<[COD]<131 mg/L; and 262. 6 mg/L of COD at effective critical point.

Key words: *Eichhornia crassipes*, oil-refinery wastewater, purification.

Study on Method of Sister Chromatid Exchange in *Vicia faba* to Detect Environment Mutagen. Kong Zhiming et al. (Dept. of Environ. Sci. and Eng., Nanjing University, Nanjing 210093): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 47—49

The experimental conditions of the Brdu-Feulgen method of SCE in *Vicia faba* root which include the content of Brdu, labelling time of Brdu, the impacts on SCE of the content of hydrochloric acid and time and temperatrue for hydrolysis were studied and discussed in this paper. The best experiment conditions and procedure, which overcome the short-comings of FPG method that is complicated in procedure and, hence, difficult to be popularized, were obtained. In addition, such method was compared with other genotoxicology method in order to probe into the possibility of utilizing such technology to detect environment mutagen.

Key words: *Vicia faba*, SCE, Brdu-Feulgen method.

A Pulse-feed Upflow Anaerobic Sludge Blanket Reactor. Su Yumin et al. (Dep. of Environ. Eng., Taiyuan Univeristy of Technology, Taiyuan 030024): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 50—53

The key parts of Upflow Anaerobic Sludge Blanket Ractor are gas-solids separator and feed system. The goals of this research, in which a conventional continuous feed system was replaced by an intermittent pulse-feed one, are to provide gently hydraulic mixing, to promote hydraulic selection, and to improve the contact between substrate and microorganisms. Pulse-feed method can raise the orgainc load rate as high as 27. 5 gCOD/(L. d), reduce HRT to nearly 3 hrs, and quickly develop granulated sludge in 47 days. It can not cause shock load and intermediates accumulation, as every pulse only releases a small amount of wastewater (1/56 reactor volume), which can not raise the substrate concentration in whole reactor. The pulse-feed also can not cause sever wash-out of sludge, because pulse-feed mi-xing can effectively separate sludge flocs and entrapped gas bubbles, and hence improve sludge settleability. The advantages of enrichment of *methanosarcina* species in the process of granulation are also discussed. At high load rate, *methanosarcina* species do appear in clumps on the granules.

Key words: anaerobic digestion, UASB, pulse-feed, mixing, granulation, *methanosarcina* species.

Study on Biological Pretreatment Method-bio-ceramic Reactor Treating Micro-pollution Source Water at Low Temperature and Low Turbidity. Hu Jiangyong et al. (Dept. of Environ. Eng., Tsinghua Univ., Beijing 100084): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 54—56

One of biological pretreatment methods-bio-ceramic reactor (BCR) was used to treat a typical source water with micro-pollution at low temperature and low turbidity. By means of in-situ experiments with the bio-ceramic reactor, it was found that: the organic matter (OC or COD), ammonia, SS in the source water could be removed about 20%—30%, 60%—70% and 80%, respectively. Removl efficiency could be reduced at low temperature. Low turbidity and high concentration of organics in the source water would be benifical to BCR. In general, BCR would be a powerful way to purificate this kind of source water.

Key words: micro-pollution, source water, low temperature, low turbidity, organics, bio-ceramic pretreatment process.

Studies on the Leaching and Species of Aluminum in Soil. Huang Yanchu and Qu Changling (Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing 100085): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 57—59

The leaching and chemical forms of aluminum in soil by sequential fraction procedure were studied. Solutions used sequentially to extract Al are inorder of 1 mol/L KCl, 1 mol/L NH_4Ac, 1 mol/L HCl and 0. 5 mol/L NaOH. The spectrophotometric determination of leaching Al was performed with Eriochrom Cyamine RC. It has been found that the type of soil and the amounts of organic materials and total Al in soil have a siginificant effect on the amount of leaching Al. A certain amount of exchangeable Al can be leached from acid soil with 1 mol/L KCl extractant, however, it can not be leached from alkaline soil. The leaching Al extracted with 0. 5 mol/L NaOH is correlated at a high level of siginficance with the total Al in soil.

Key words: soil, leaching aluminum, chemical form.

Efficiency of Fluidized Biofilm Method for Treating Phenolic Wastewater. Yin Jun et al. (Jilin Architechtural and Civil Eng. Institute, Changchun 130021): *Chin. J. Environ. Sci.*, **17**(1), 1996, pp. 60—62

A dynamic experiment was conducted to examine the efficiency of the fluidized biofilm method with home-made carrier for treating phenolic wastewater. The experimental results have shown that COD and phenol were removed on an average over 80% and 90%—100%, respectively, while COD volumetric loading is 4. 0 kg/(m^3·d), and the final concentrations of COD and phenol in the effluent can meet Chinese Standard of Wastewater dischange permission. The biofilm can adhere quickly to the home-made carrier and the thickness of biofilm is suitable